Ontario

VACCINES: THE BEST MEDICINE

2014 ANNUAL REPORT OF THE CHIEF MEDICAL OFFICER OF HEALTH OF ONTARIO TO THE LEGISLATIVE ASSEMBLY OF ONTARIO

The Honourable Speaker
Legislative Assembly of Ontario
Room 180, Main Legislative Building
Queen's Park
Toronto, ON M7A 1A2

Dear Speaker:

Each year, the Chief Medical Officer of Health's report focuses on a health challenge of particular importance to the people of Ontario. It is my privilege to release this year's report, *Vaccines: The Best Medicine*. The report puts the spotlight on an issue that has been prominent across newspapers, television and social media over the past few months: immunization.

As you are aware, vaccines and immunization programs are a cornerstone of public health and we see their value every day. One of our colleagues, Dr. Upton Allen, Head of Infectious Diseases at The Hospital for Sick Children, spoke for all of us when he said, "There is nothing more catastrophic than seeing a child die from a disease that you know could have been prevented with vaccination."

Vaccines are a critical tool in our efforts to prevent disease and enhance health. Ontario has had a long and successful immunization history and a strong Ontario immunization system that continually works to improve its effectiveness, and we are not done yet! With improved technology, systems and supports, we can provide stronger protection from vaccine-preventable disease for all in Ontario.

Given all the recent information being spread about vaccines — both accurate and inaccurate — my report attempts to cut through all the noise by focusing on what we know, without doubt, to be true. It sets out the health risks for children and adults without immunization and describes the significant improvements in rates of vaccine-preventable diseases since the introduction of vaccine programs. It also discusses the current strengths and gaps in Ontario's immunization system.

In the report, I also recommend five steps that Ontario should take to ensure all of us continue to reap the full benefits of vaccines and immunization programs:

1. Join the conversation – it takes all of us!

Together, we can build public confidence in vaccines and immunizations. A small number of Ontarians are hesitant about vaccines. For some, confidence is the concern. We need to reach this group and build their confidence. We must actively communicate the message that vaccines are the best medicine and be part of the conversations that inform people's values and their decisions.

2. Virtually replace the "Yellow Card".

We must expand the content of Panorama, an immunization repository now being used to record school children's vaccinations, to track immunizations for all Ontarians. The system will help Ontarians and their health care providers know which shots they've had and which ones they need. Building on the solid foundation that is operating today, more comprehensive information will lead to safer, more efficient, more convenient and more cost-effective immunization programs.

3. Make it easier for everyone to be immunized.

One of the biggest barriers to getting all Ontarians fully immunized is the complex immunization schedule. Ontario needs to develop smartphone apps and electronic systems that remind Ontarians when they or their children need a particular shot.

4. Pain-free immunizations.

Ontario should put more focus on developing pain-free ways to deliver vaccines — such as vaccines that can be taken orally or nasally — as well as ensuring that steps are taken to mitigate injection pain with immunization — evidence-based guidelines covering all ages are available — we just need to widely apply them.

5. Stay alert to current and emerging threats.

Vaccines are the first line of defence against infectious diseases. Ontario must be ready to adopt and provide new vaccines that can benefit Ontarians as they become available.

The public health system under my leadership looks forward to working closely with the government to keep our immunization system strong and Ontarians healthy.

Sincerely,

Original signed by
Dr. David Williams
Chief Medical Officer of Health

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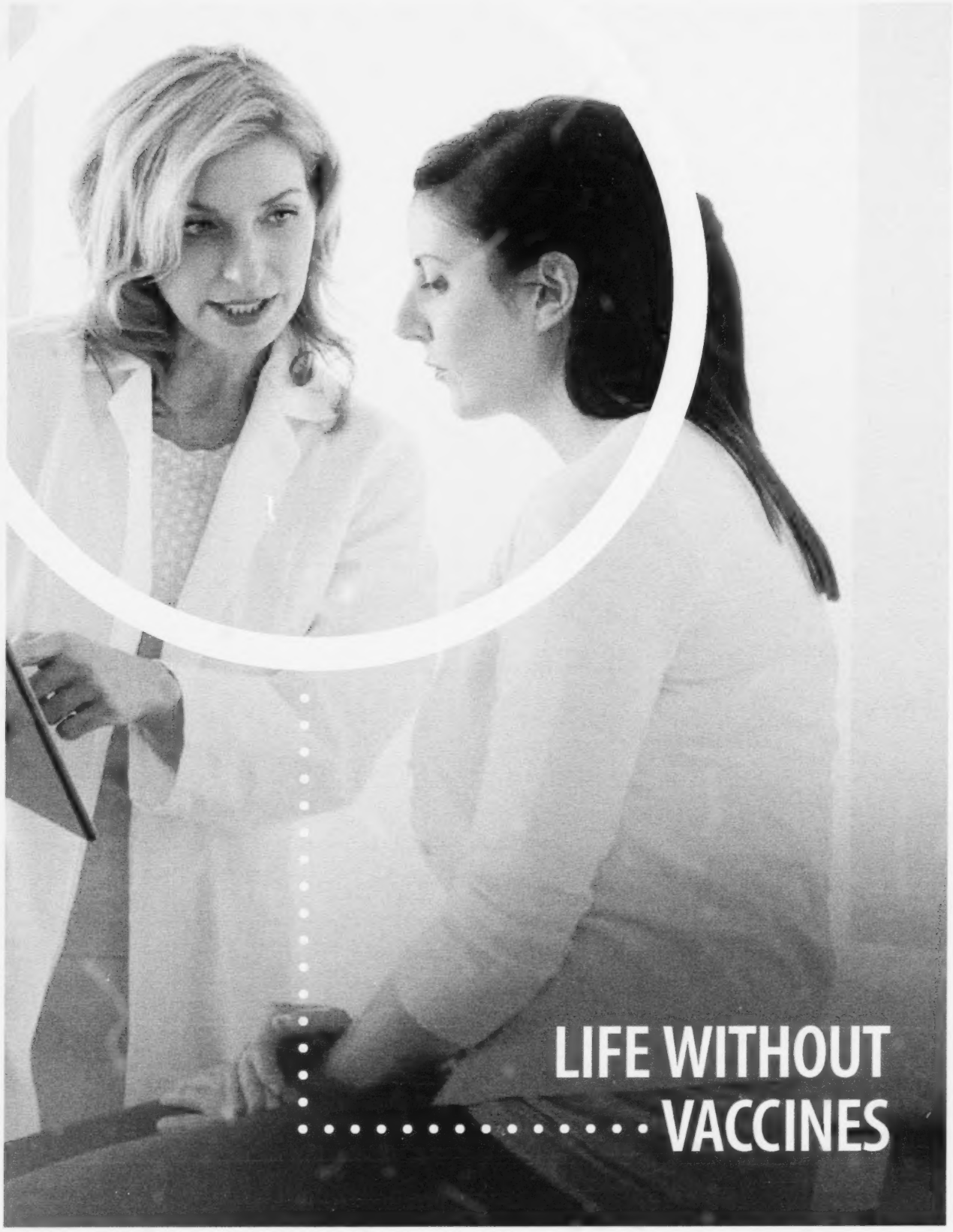

LIFE WITHOUT
VACCINES

LIFE WITHOUT VACCINES...

Vaccines are one of the best medicines. Unlike many other medicines, they help prevent disease, which is always better than having people fall ill and need treatment. Over the past 100 years, vaccines have had a dramatic effect on our health and well-being. By reducing and — in one case, smallpox — eradicating a disease from the globe, they have changed the course of history.

Most Ontarians are too young to remember the time before vaccines protected us from so many diseases. However, some are not.

"In 2003, I was covering as medical officer of health in a Northern area when the community was rocked by invasive meningococcal disease," recalls David Williams, Chief Medical Officer of Health. "There were a total of three cases in previously healthy teenagers, two of whom were very sick and one unfortunately passed away. People were understandably worried and anxious for the health of their children and needed timely and reliable information to reduce the level of concern. Through our communication efforts, we were able to reassure the community and successfully implement the mass immunization of more than 11,000 people ages 14 to 20 years to stop the spread of this deadly disease."

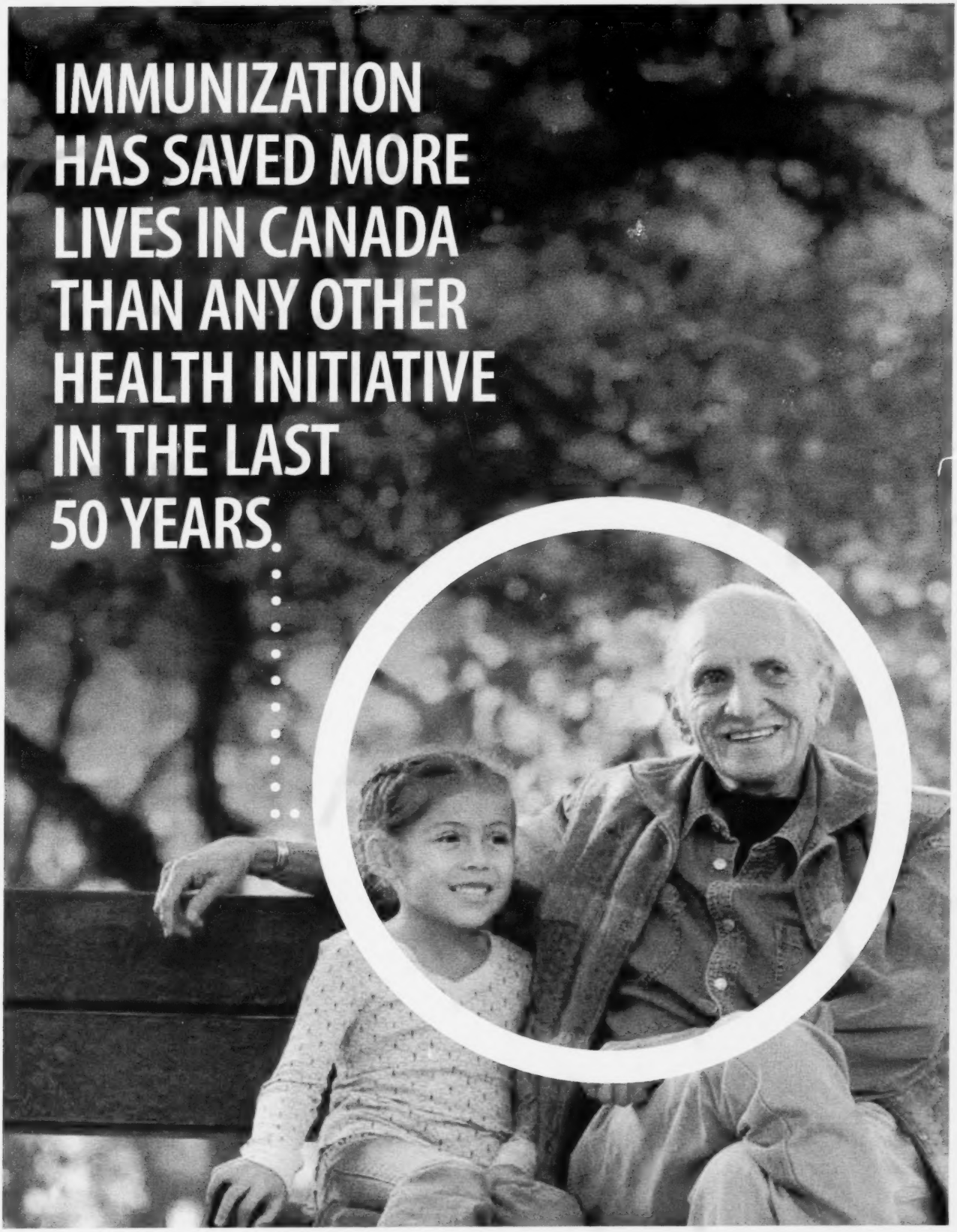
Even childhood diseases that aren't as immediately life threatening are extremely hard on children and can have life-long consequences. Valerie Jaeger, Medical Officer of Health in Niagara, had a severe case of measles as a child. This year, she was faced with an outbreak of measles in the Niagara Region, and it brought back vivid memories.

"Just before Christmas in the year I turned seven, I came down with measles — which I caught at my cousin's birthday party," Dr. Jaeger explained. "I have never felt sicker. I was isolated in my grandmother's house and had to stay in bed in a darkened room — with the curtains closed. I remember the doctor being very angry with my grandmother because the curtains had been left open a crack.

"Measles is a horrible illness but what people don't understand is that it can have consequences for the rest of your life. People often say that 'what doesn't kill you makes you stronger,' but that's not always true. Sometimes it just makes you sick.

"Measles can affect the central brain or the optic nerve, which is what happened to me. It affected my vision and, as a result, I don't see well. I have had to deal with the impact of measles my whole life, and I don't want anyone else's child to have the same experience.

"I have two children of my own, and they were vaccinated. I had measles and my kids had the shots — and the shots are better."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Vaccines have either globally eradicated (smallpox), eliminated from entire regions of the world (polio) or substantially reduced once-common and sometimes deadly diseases (*Haemophilus influenzae* type b [Hib]).

A SNAPSHOT OF OUR HEALTH BEFORE AND AFTER VACCINES

Longer Lives

Canadians and Ontarians are living longer. In the last century, our life expectancy has increased by about 30 years[1] — and we owe about 25 of those 30 years to public health measures like vaccines, clean water, sanitation, improved nutrition and personal hygiene.[2]

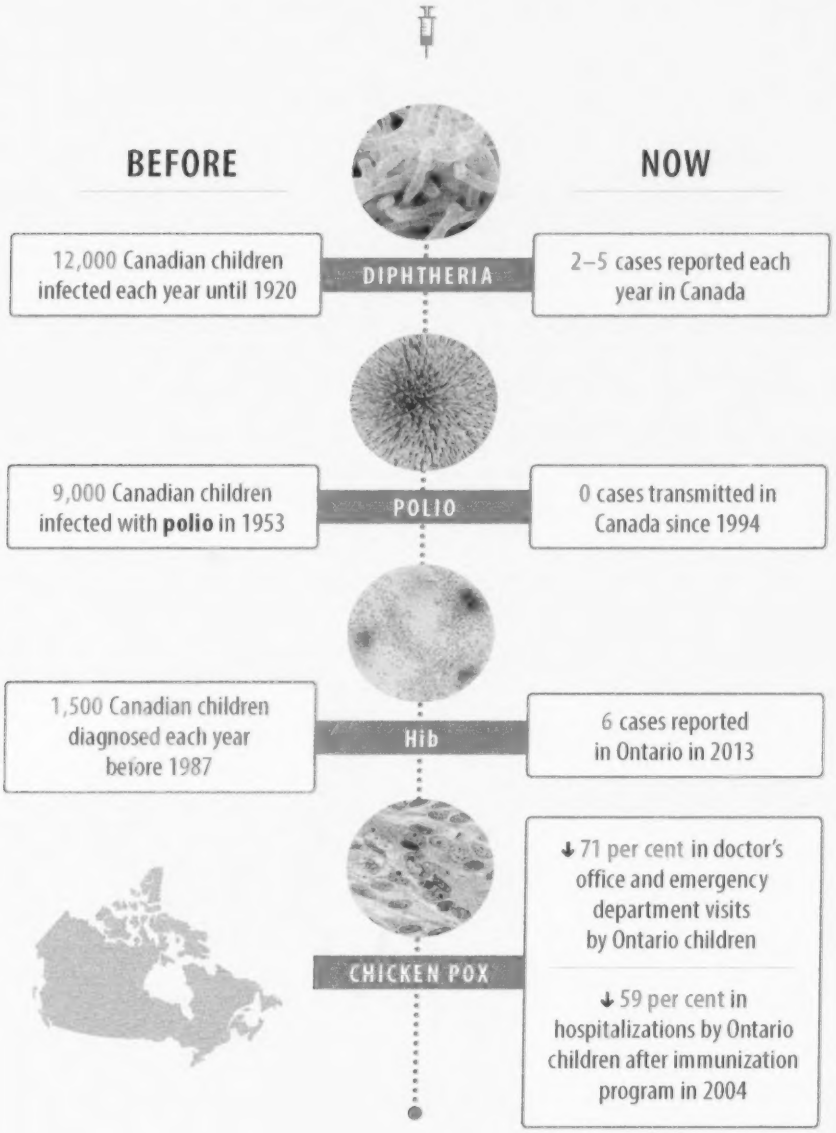
AVERAGE LIFE EXPECTANCY

Average life expectancy for Canadians in 1900 before vaccines and other public health measures were introduced.

Average life expectancy for Canadians in 2012.

HEALTHIER CHILDREN

Because of immunization, our children are healthier. Fewer die in childhood and fewer experience life-long disabilities caused by vaccine-preventable diseases. Immunization has dramatically reduced diseases that used to kill and disable hundreds of children every year, such as diphtheria, polio and Hib.


BEFORE
NOW
12,000 Canadian children infected each year until 1920
DIPHTHERIA
2–5 cases reported each year in Canada
9,000 Canadian children infected with **polio** in 1953
POLIO
0 cases transmitted in Canada since 1994
1,500 Canadian children diagnosed each year before 1987
Hib
6 cases reported in Ontario in 2013
CHICKEN POX
↓ 71 per cent in doctor's office and emergency department visits by Ontario children
↓ 59 per cent in hospitalizations by Ontario children after immunization program in 2004

DIPHTHERIA

Diphtheria is caused by a bacterium that spreads when people cough or sneeze. Symptoms include a sore throat, loss of appetite and fever. Airways become blocked making it extremely difficult to breathe. Almost one in 10 children who got diphtheria died. Many who survived experienced complications such as pneumonia, damage to their heart or nerves and, in some cases, paralysis.

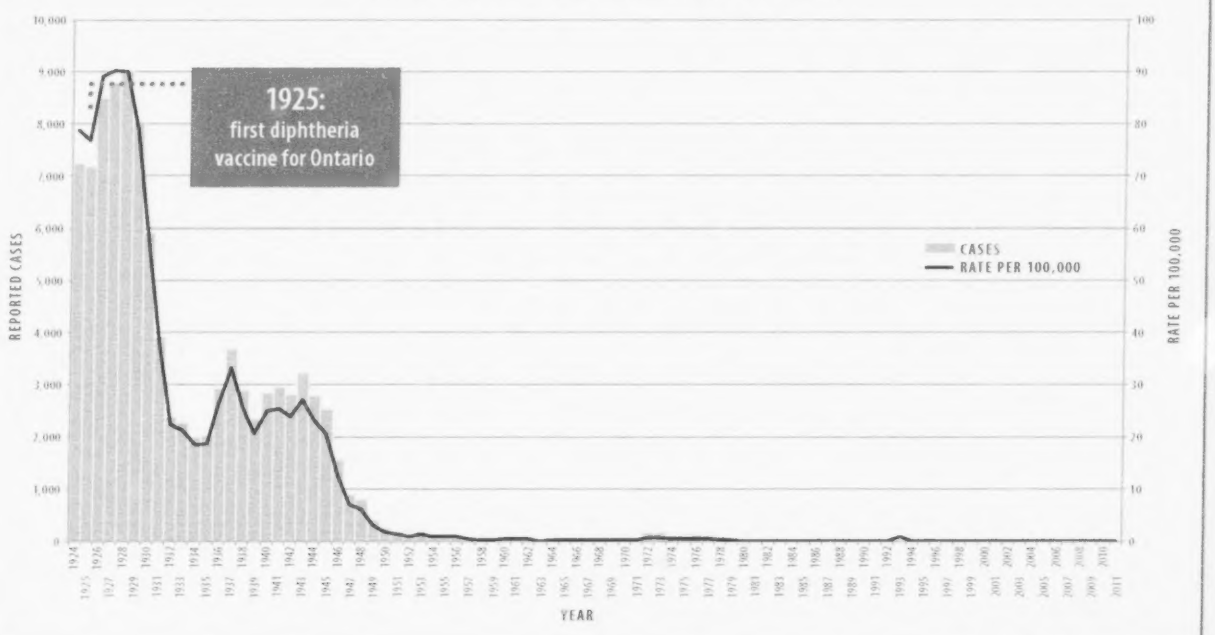
BEFORE VACCINE[3]

12,000	Canadian children infected with **diphtheria each year until 1920**.
1,000	Deaths each year in Canada from diphtheria. Diphtheria was one of the most common causes of death in children between the ages of one and five years.
2 in 10	Children under age five with diphtheria died.

NOW[4,5]

2–5	Cases of diphtheria reported in Canada each year.
0	Cases of diphtheria reported in Ontario in 2013.

FIGURE 1: DIPHTHERIA IN CANADA, 1924–2012



POLIO

Canada experienced its first known polio outbreak in 1910. A little girl was taken to a hospital in Hamilton, Ontario, with what was thought to be rabies. She died. Doctors later discovered she had polio. Polio spreads when people have contact with someone infected with the virus. Many people infected with the polio virus have no signs of illness, which means they can expose others without knowing it. To prevent polio's spread, provincial public health departments used to isolate the sick, close schools and restrict children from travelling or going to movie theatres.[6] However, these measures were not enough. The only thing that could stop polio was a vaccine.

BEFORE VACCINE[6]

9,000 Canadian children infected with polio in 1953 — the year the disease peaked. Five hundred died.

11,000 Canadians left paralyzed by polio between 1949 and 1954.
Even people who recover from polio can develop symptoms, such as progressive muscle weakness, severe fatigue and muscle and joint pain, 15 to 40 years after their initial illness.

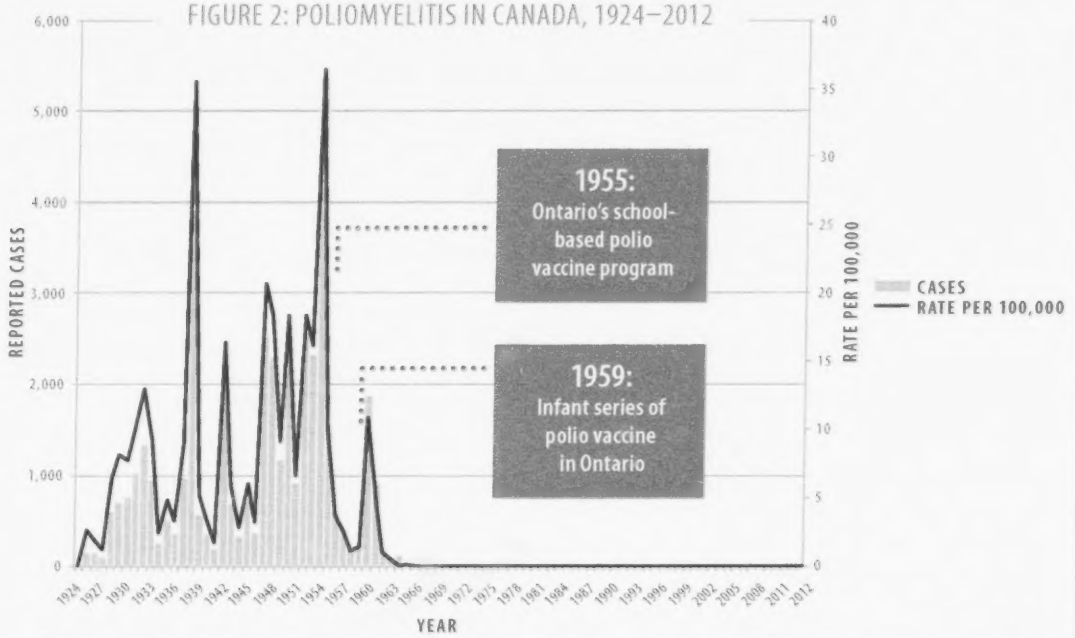
27 Number of iron lungs assembled in Ontario in a six-week period in 1937 to help children with polio breathe.

NOW[6,7,8]

0 Cases of polio transmitted in Canada since 1994 — the year when Canada was declared polio-free. (We still see the rare case of polio in people who immigrate to Canada from one of the only three countries that still have the disease.) The global community, working together, is now close to eradicating polio worldwide.

2 Number of countries in the world with endemic polio as of September 2015: Pakistan and Afghanistan.

FIGURE 2: POLIOMYELITIS IN CANADA, 1924–2012



HAEMOPHILUS INFLUENZAE TYPE B (Hib)

Haemophilus influenzae type b is spread by direct contact or when people cough or sneeze. In young children, Hib infection can block airways (epiglottis) making breathing almost impossible. It can also cause meningitis — an inflammation of the membranes around the brain and spinal cord — and serious infections in the blood, skin or joints. People who survive meningitis often experience brain damage and hearing loss.

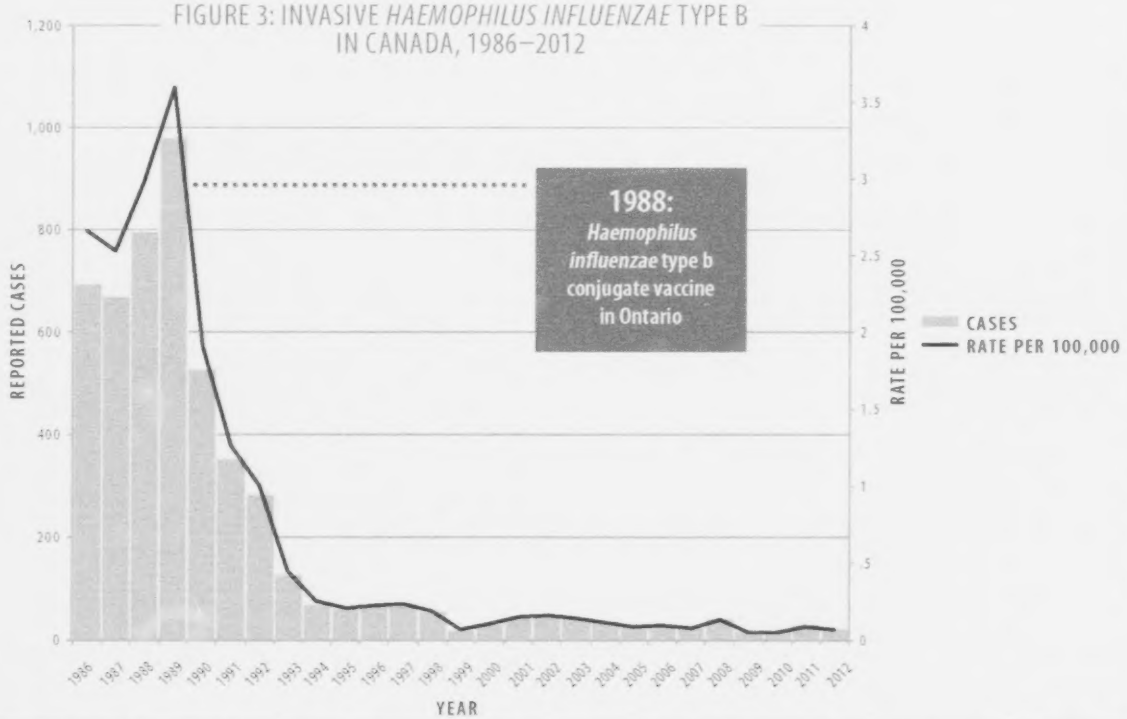
BEFORE VACCINE[9]

1,500	Number of Canadian children diagnosed each year with Hib — the most common cause of childhood bacterial meningitis before 1987 when a vaccine was introduced.
1 in 20	Children infected with Hib died.
1 in 10	Children infected with Hib suffered severe neurological damage.
1 in 5	Children infected with Hib lost their hearing.

NOW[4,10]

6 Cases of Hib reported in Ontario in 2013 — 26 years after we started routinely immunizing all infants against Hib. This disease has almost disappeared in Ontario.

FIGURE 3: INVASIVE *HAEMOPHILUS INFLUENZAE* TYPE B IN CANADA, 1986–2012



HEALTH AND ECONOMIC BENEFITS

Vaccines keep us healthy, which means fewer hospital and doctor visits for these diseases. Health care resources once used to treat vaccine-preventable diseases can now be used in other ways.

CHICKENPOX[11]

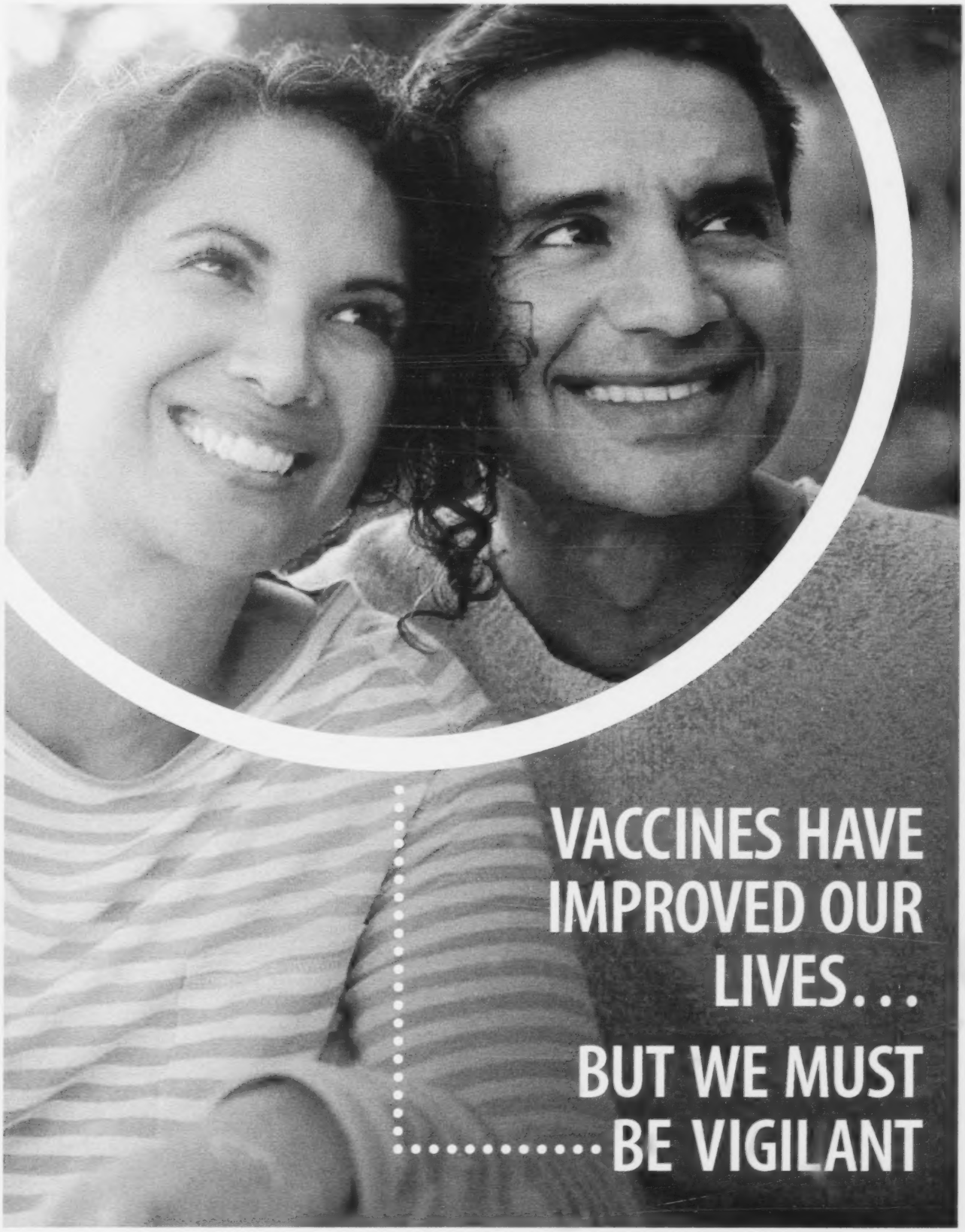
↓71%

In doctor's office and emergency department visits for chickenpox by Ontario children after the public immunization program was introduced in 2004.

↓59%

In hospitalizations for chickenpox by Ontario children after the public immunization program was introduced in 2004.

Prior to vaccination, many Ontarians developed chickenpox each year, which led to a large number of health care visits and hospitalizations. And since most cases of chickenpox occurred in children under 12 years of age, this infection caused parents lost time from work to stay home with their sick children. Because of the vaccine, we save money from decreased use of health care services and less lost work time for parents.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Vaccine programs have saved many lives and helped avoid much illness and sorrow. Several generations of Ontarians have never experienced outbreaks of diphtheria, polio or many other illnesses that used to be real and present threats. But we must remain vigilant.

In the past few years, we have seen how easy it is to lose ground in our efforts to prevent diseases when even a very small percentage of the population is under-immunized.

Measles Outbreaks Do Occur

Although measles is now rare in Canada, the disease is still common elsewhere in the world. Since international travel is fast and easy, outbreaks of diseases as contagious as measles can spread quickly across borders. Measles outbreaks continue to occur because there are pockets of susceptible people who are either unimmunized or under-immunized (i.e., they did not receive all recommended doses of the measles-containing vaccines). When parents decide against vaccinating their children or delay their immunizations, the number of susceptible children increases and that makes it easier for measles and other vaccine-preventable infections to spread.[12]

- In 2011, 22 people who had been travelling (mainly in Europe) "imported" cases of measles back to Quebec. Some of these cases spread their infection resulting in 776 additional reported cases (in fact, one single case led to 678 cases) and resulted in the largest measles epidemic in North America in a decade. This outbreak occurred even though Quebec had high vaccination rates: 95 to 97 per cent had received one dose of vaccine, 90 per cent had received two doses and only three to five per cent were totally unvaccinated. The outbreak hit mainly adolescents between the ages of 12 and 17, but it also affected younger children and adults. It highlighted two key challenges in controlling measles: even a very small number of people who are unvaccinated (three to five per cent) can open the door to a large number of cases; and even some people who have been fully or partially

WHY DO SOME PEOPLE WHO WERE VACCINATED STILL GET SICK?

Most people who are immunized develop a fully protective response but vaccines are not 100 per cent effective. Some people — particularly those who are older or whose immune systems are weak or waning — develop only partial protection. That means they can still get measles, but fortunately, they will get a less severe case than if they had not been vaccinated at all.

vaccinated can become infected when measles is circulating — although they are much less likely to be infected than those who are unvaccinated and their diseases can be milder.[13]

- Between January 1 and July 19, 2014, British Columbia confirmed 446 measles cases. Most (431) were part of a large outbreak in the Fraser Valley in a community that had low vaccination rates. The outbreak likely started when some community members had returned from a trip to the Netherlands, where a measles outbreak occurred from May 2013 until March 2014.[14]
- In 2015, the United States had a large multi-state measles outbreak that is believed to have been started by a traveller who went to an amusement park in California. By April 2, 2015, 111 people had come down with measles, most of whom had not been vaccinated.[15]
- Between 2006 and 2012, Ontario had a total of 33 reported cases of measles, most related to travel or contact with someone who had travelled. As of June 17, 2015, 20 people in Ontario had come down with measles this year — 18 were part of the same cluster. Of those 18 people with infection, two adults had to be hospitalized. The source of the outbreak remains unclear. Among those whose immunization status was known, only 14 per cent were fully immunized.[16]

One Family's Story

Measles outbreaks are about more than statistics. They can profoundly affect people's lives. Jennifer Hibben-White is the mother of an infant son, Griffin, who was exposed to measles when he was 15 days old when she took him to the doctor's office for a well-baby visit. She blogged about her experience and her story went viral.[17]

"I received a phone call from York Region Public Health telling me that someone who later developed measles sat in the doctor's office between 30 minutes and 60 minutes before we arrived. Because measles is airborne and can stay in the air and on surfaces for up to two hours, we had been exposed. I learned that measles is incredibly contagious — about 90 per cent of infants who are exposed will catch measles. I had been vaccinated but Griffin was too young to get the measles vaccine so he was at risk. My three-year-old daughter had only received one shot so she was technically at risk too. We were to stay at home — and away from others — until the incubation period for measles was over."

Having your newborn exposed to measles would be frightening for any parent, but it was particularly terrifying for Jennifer and her husband because they had already experienced the death of a child. Her five-year-old daughter died from an illness that could not be prevented by a vaccine.

As she explained, "We have been through hell — we know what the death of a child feels like — and to think that people would play Russian roulette with their children is unbelievable to me. One of the privileges we have as a society — thanks to immunization — is that we are blessed not to suffer the effects of measles. Because we don't live through it anymore, a lot of parents think it's only some spots. They forget that it can also cause blindness, brain swelling and death — and the risk is greatest for infants."

Griffin and the whole Hibben-White family are fine but the measles scare caused anxiety and anguish that Jennifer hopes no other family will experience.

Whooping Cough – Pertussis – is Still a Threat

Pertussis, a bacterial infection also known as whooping cough, causes fits of coughing followed by a deep inhalation that makes a "whooping" sound. Babies, who are too young to be vaccinated against pertussis, are particularly vulnerable. They are more likely to develop complications such as pneumonia and seizures, and they are more likely to die from the infection.

There is always some pertussis circulating and a number of sporadic cases occur each year. However, between November 2011 and April 2013, Ontario experienced a prolonged whooping cough outbreak. The first cases occurred in members of an under-immunized religious community and then spread to the general population and a second religious community in the same part of the province. It resulted in 443 confirmed and probable cases in Southwestern Ontario — 13 children were hospitalized, but thankfully no one died. Analysis of the outbreak and the immunization status of the children that developed whooping cough showed that a third were fully immunized. The risk of pertussis is high in those who are unvaccinated but — because the current vaccine is not perfect (see box below) and its protection wanes over time — even those who are fully vaccinated can become infected when pertussis is circulating.[18]

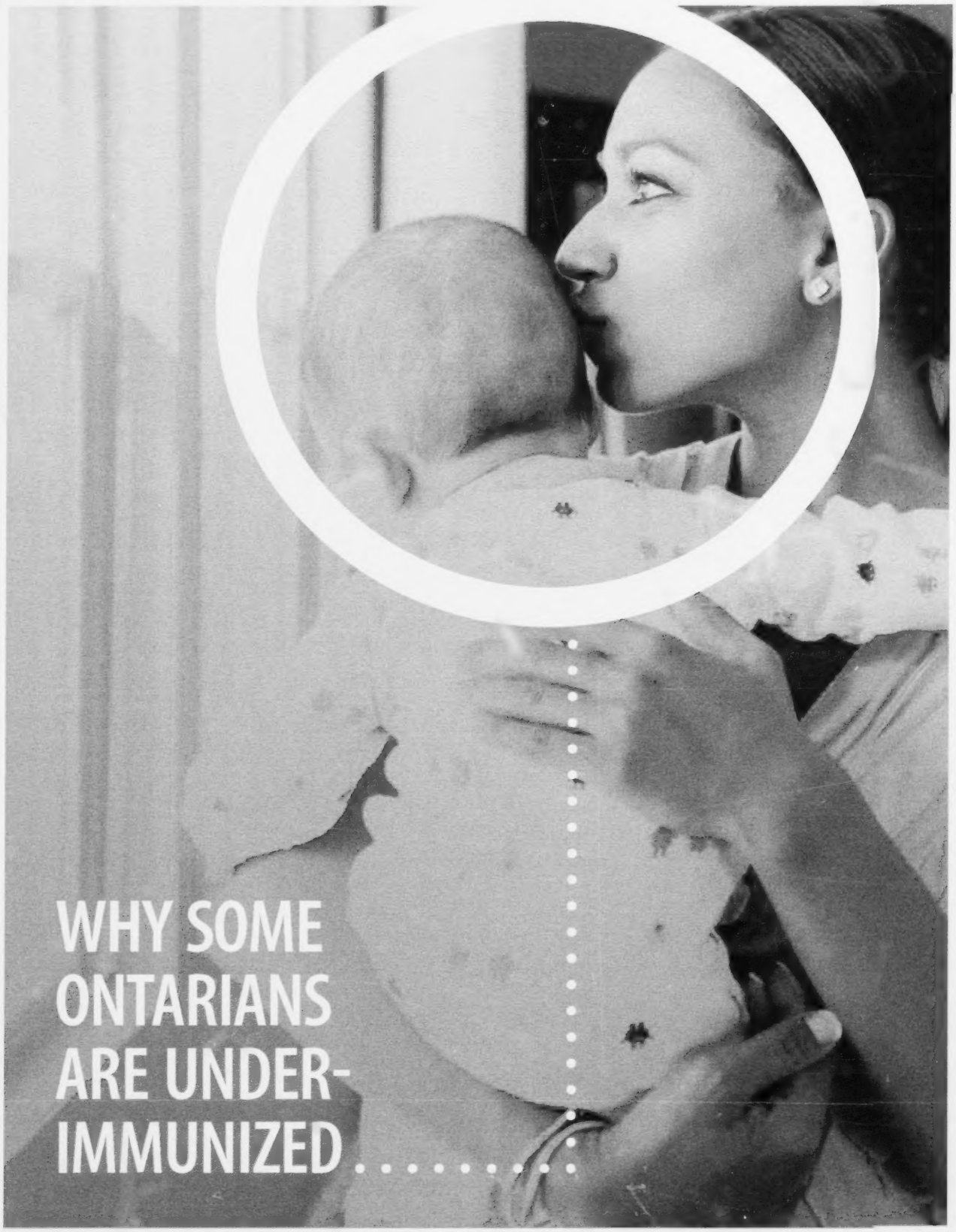
EFFORTS TO IMPROVE PERTUSSIS VACCINATION STRATEGIES

Thanks to pertussis vaccine, the number of infections each year in Canada has dropped dramatically. However, controlling pertussis remains a challenge because the vaccine we currently use provides good — but not perfect — protection.

Before 1997, children received a "whole-cell" pertussis vaccine in combination with other childhood vaccinations at two, four and six months of age, with booster doses at 18 months and between four and six years of age. This vaccine consisted of the entire pertussis organism, which was inactivated so it could not cause infection. The combination vaccine was effective but it had some side effects, such as rash at the injection site, fever and irritability in babies, and it could only be given to children under seven years of age.

In 1997, Ontario replaced the whole cell pertussis vaccine and started using a new "acellular" pertussis vaccine, which contained only five proteins from the bacterium. This vaccine caused fewer side effects and could be given to babies, children, adolescents and adults. In 2003, this newer vaccine was recommended for teenagers and given in combination with the 14-to 16-year-old tetanus and diphtheria booster shot — to prevent adolescents from getting sick and bringing the infection home to their younger brothers and sisters. In 2011, the pertussis vaccine was expanded to include adults 18 to 65 years of age and, in 2014, to adults of all ages.

Although many more Ontarians are now immunized against pertussis, it appears that the acellular vaccine is less effective than the whole cell vaccine, and its effectiveness can decrease or wane over time. As a result, pertussis infections occasionally occur in people who were vaccinated, and Ontario's adolescent and adult pertussis boosters are vital to maintaining immunity in the population.



WHY SOME ONTARIANS ARE UNDER-IMMUNIZED.....

WHY SOME ONTARIANS ARE UNDER-IMMUNIZED

Almost all Ontarians actively participate in childhood and adolescent immunization programs. Only a very small number — 1.5 per cent — of school pupils are exempt from immunizations for medical or religious reasons or because of conscientious objections.

Despite these high participation rates, some Ontarians are under-immunized, in that they haven't received all recommended vaccines, and a small number are hesitant about having their children immunized. Why are some people under-immunized or hesitant? It usually comes down to the three "Cs": complacency, convenience and confidence.[19]

01 Complacency

Because most Ontarians have never experienced the devastating impact of diseases like smallpox, diphtheria, Hib, polio or measles, being immunized may not seem as urgent for families trying to balance busy schedules as it did when so many children were falling ill.

02 Lack of Convenience

Although people can receive vaccines from many different locations (see box on page 22), it's still a challenge for families to keep up with the immunization schedule, which requires different shots at different ages and stages.

It's easiest with young children because immunizations are given when they go for routine well-baby and child visits. However, even young children will require seven visits to receive a total of 14 vaccinations (given by injection and by mouth) before they turn seven years of age — not including the annual flu vaccine that is recommended beginning at six months of age (including two doses in the first flu season that the baby is vaccinated). With so many vaccines and doses, it can be difficult for both parents and providers to ensure children receive all their vaccines at the right time and are fully protected.

Currently, most parents rely on a yellow card to keep track of their child's immunizations, but cards can be lost and it can be difficult to determine when your child is ready for their next immunization.

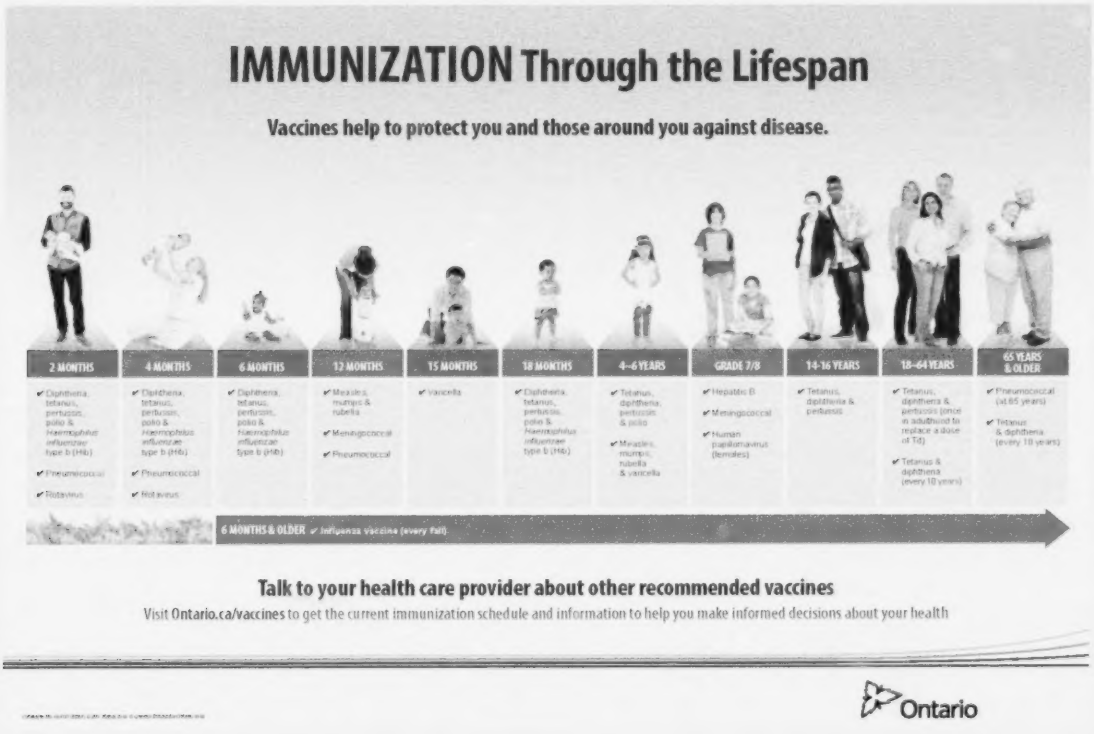
Panorama, a new provincial immunization information system that provides the foundation for an immunization registry, makes it easier for the system to track the vaccines and doses that Ontarians receive for parents, health care providers and the system as a whole. Panorama is now being broadly used across Ontario's public health units and holds over 83 million standardized immunization records. This provides accurate vaccine information on school-age children, helping to identify which children require which vaccines to ensure our vaccination coverage rates protect Ontario's children. Up-to-date, accurate immunization information also ensures that students will not be unnecessarily suspended from school under Ontario's immunization legislation, the *Immunization of School Pupils Act (ISPA)*.

Work is also underway to incorporate standardized immunization data from all health care providers into the provincial immunization repository so accurate vaccination information can be collected in real time for all children and adults. Eventually, this will ensure that all health care providers have consolidated and up-to-date vaccination information at all times in all health care locations through an immunization registry. Given the complexity of the immunization schedule, the ability of the Panorama system to forecast which vaccines are required for each client will, when fully implemented, ensure protection from vaccine-preventable diseases for all.

Until Panorama is fully implemented, it is important for parents to continue reporting their children's immunizations to their local public health unit.

PLACES TO GO FOR IMMUNIZATION

- Your primary care provider (for most vaccines)
- Local public health immunization clinics that provide some or all vaccines
- Clinics at schools where public health nurses vaccinate students against meningococcus, hepatitis B and human papillomavirus
- Pharmacies and some workplaces for flu vaccines
- Specialized travel clinics for travel vaccines (the traveller has to pay for most of these vaccines)
- Emergency departments and walk-in clinics for vaccines required after a potential exposure to a vaccine-preventable disease
- Long-term care and retirement homes for vaccines for residents
- Hospitals for some patients


IMMUNIZATION Through the Lifespan
Vaccines help to protect you and those around you against disease.
2 MONTHS
4 MONTHS
6 MONTHS
12 MONTHS
15 MONTHS
18 MONTHS
4–6 YEARS
GRADE 7/8
14-16 YEARS
18–64 YEARS
65 YEARS & OLDER
6 MONTHS & OLDER ✔ Influenza vaccine (every Fall)
Talk to your health care provider about other recommended vaccines
Visit Ontario.ca/vaccines to get the current immunization schedule and information to help you make informed decisions about your health
Ontario

03 Less Confidence

Some of the recent increase in vaccine hesitancy started with an article that falsely claimed a link between the measles vaccine and autism. Over the past 15 years, a number of large studies have failed to find any association between measles vaccine and autism. In fact, a new large-scale study has shown yet again that the measles, mumps and rubella (MMR) vaccine has no association with autism.[20] The studies that show no link between MMR vaccine and autism include more than 1.2 million children.[21] But the damage caused by the original misinformation has been hard to undo.

> **"You think you are protecting your children from thimerosal? You aren't. It's not in their vaccine. You think you are protecting them from autism? You aren't. There is no, none, nada, nothing in science that proves this."**
>
> Jennifer Hibben-White,
> My 15-Day-Old Son May Have Measles.
> Blog Post 2/11/2015.

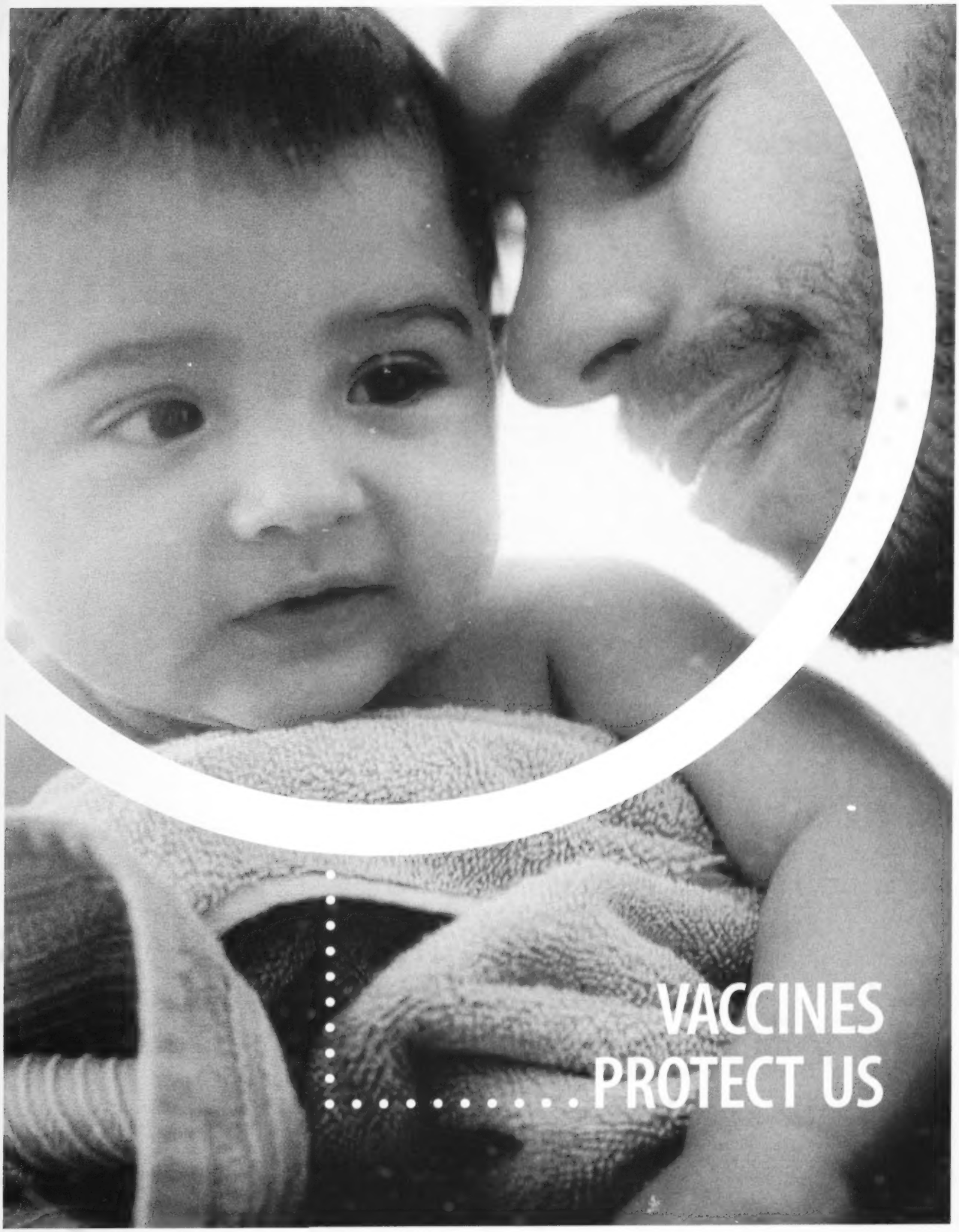
Until the recent measles and whooping cough outbreaks, pro-vaccine voices have been relatively quiet. One of the reasons that Jennifer Hibben-White's blog (see story on page 19) was so powerful and persuasive is that she challenged some of the anti-vaccine myths.

During Ontario's 2015 measles outbreak, the mainstream media also did an excellent job of getting accurate vaccine information out.

However, we must do more to dispel misperceptions and build confidence in vaccines.

VACCINE FEARS BASED ON FALSE INFORMATION

In the study that alleged a link between the measles vaccine and autism published in the Lancet in 1998, Dr. Andrew Wakefield failed to declare conflicts of interests — including large payments from lawyers involved in a vaccine-related lawsuit and his attempts to patent his own vaccines. Shortly after the article was published, it was discovered that it contained false data. Ten co-authors withdrew their names and, in 2010, the journal retracted the article entirely. The editor-in-chief called it "utterly false" and "fraudulent" and Wakefield later lost his licence to practice medicine in the United Kingdom.


VACCINES
PROTECT US

VACCINES PROTECT US

Although the vast majority of Ontarians support and participate in vaccine programs, they sometimes struggle to find reliable information about immunization or to get their questions answered. To keep our immunization system strong, it is important to understand Ontarians' concerns and have a multi-pronged approach, including providing user-friendly, accurate information that helps everyone understand the real benefits and risks of vaccines. This report is part of a public health effort to do just that, and to build public confidence in the excellent and safe vaccines and immunization programs offered in Ontario.

Here are four key facts about vaccines:

01 Vaccines are as Safe as Possible

The vaccine system in Canada does everything it can to make sure vaccines are as safe as they can be. Vaccines are studied and carefully and continuously monitored for their safety during development, manufacturing and after they are in public use.

The process for approving a vaccine is complex and thorough. Manufacturers have to follow strict guidelines when making vaccines and each new lot of vaccine is tested to ensure it meets the expected high standards. Many countries, including Canada, have their own review processes that the manufacturer needs to follow before a vaccine is allowed to be used in their country. This means that many independent experts assess a vaccine before it is used to ensure that it works well and is safe.

Once vaccines are in use, there is a system to continuously monitor their safety that involves the manufacturers and regulators, as well as health care providers and local, provincial, national and global public health organizations.

Like any medication though, vaccines can have side effects. The most common reaction after immunization is soreness, redness or swelling at the injection site, which usually goes away on its own in a few days. Serious reactions to vaccines are extremely rare, and much rarer than the complications from diseases that are prevented by the vaccine.

Health care providers are required to report certain adverse reactions that occur after immunization to their local public health unit. Based on the results of Public Health Ontario's 2013 Annual Report on Vaccine Safety in Ontario, vaccines used in the province are safe and have a low risk of adverse reactions. Of the 8.2 million doses of vaccine distributed in Ontario in 2013, 642 adverse reactions were reported. Most were mild, such as pain, redness, or swelling around the injection site, rashes and a smaller number of fevers. Only 27 — or 3.3 in every one million doses — were considered severe. They included reactions such as febrile seizures, cellulitis and anaphylaxis — all of which were successfully treated.[22]

02 Vaccines Protect Individuals

Vaccines work by kick-starting the body's own immune system.

A vaccine deliberately introduces a person's immune system to pieces of, or an entire inactivated virus or bacterium, or a weakened virus. The immune system responds to the vaccine by developing antibodies that stay around in the body, ready to inactivate real viruses or bacteria if the person is ever exposed to it. Vaccines create long-term individual immunity helping the recipient fight off infection, without the person having to get the disease. Furthermore, with improved vaccine production technology, protection for Ontarians will continue to be strengthened.

The Public Health Agency of Canada provides more information on how this process works at: http://www.phac-aspc.gc.ca/im/vs-sv/vs-faq01-eng.php

03 Vaccines Protect Communities

Vaccines protect individuals. They also protect communities because when individuals are immunized they don't catch vaccine-preventable diseases and therefore they do not spread them to others. When only a few people in a community are immunized, a disease can still spread quickly among those who are not immunized. However, when a critical mass of people are immunized — that is, when vaccination rates are high — then it is much less likely that diseases will spread widely in the community. This protection is often referred to as "community" protection ("herd" immunity).

Having a large proportion of the population immunized is particularly important because community immunity protects the most vulnerable among us — such as infants, people who cannot receive some vaccines because of problems with their immune system and those for whom a vaccine doesn't work. For example:

- Community immunity helps protect infants less than one year of age (who are too young to be immunized) from measles. Immunizing young children against chickenpox protects adolescents and adults who didn't have chickenpox as a child, as well as people who cannot be vaccinated.
- When enough people in a community, in society and in the world are immunized with an effective vaccine, the pathogen itself has trouble spreading and can die out. That's what happened with smallpox. The last known natural case was in Somalia in 1977. The disease is gone and there's no risk — so we no longer need to be vaccinated against smallpox.

04 Immunization Programs have to be Sustained Over Time

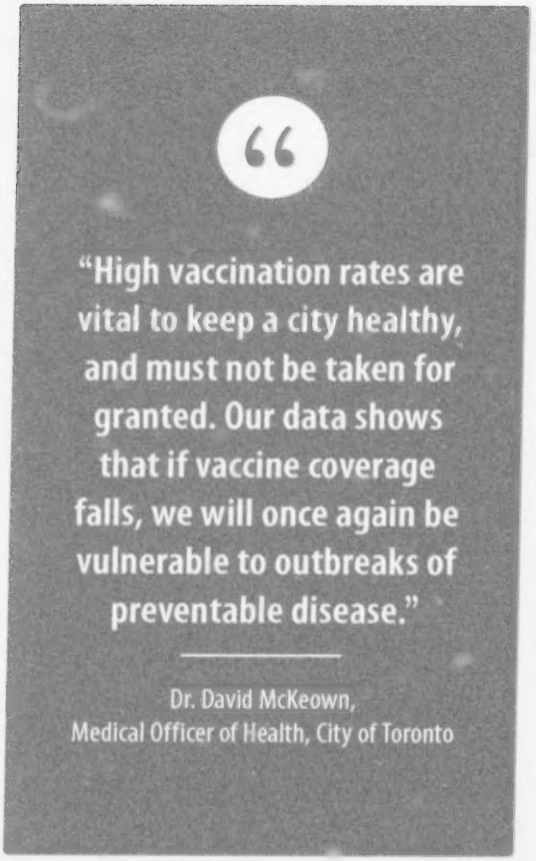
You don't have to look much farther than the headlines to understand why immunization programs are as important now as they were throughout the 20th century. Over the past few years, many parts of the developed world that thought they had diseases like measles, mumps and whooping cough under control have had outbreaks.

If vaccination coverage rates fall in Ontario, the impact could be serious and costly. According to models for the City of Toronto, the health gains provided by current high levels of vaccination would be lost if vaccination rates decline — even slightly.[23]

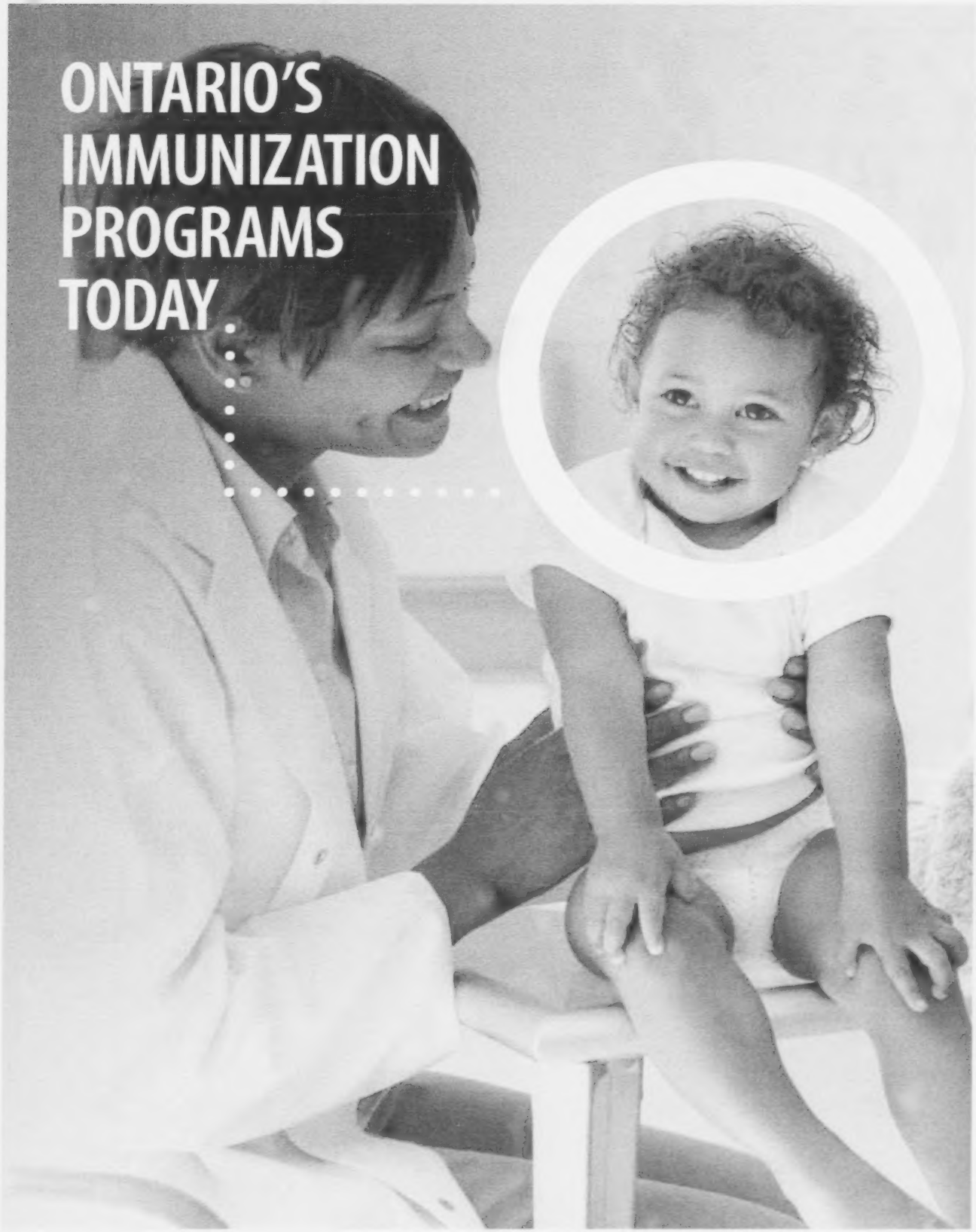
For example:

- About 95 per cent of Toronto children are immunized against measles. However, because measles is highly infectious and persists in other parts of the world, just a small decline in measles vaccination rates in Toronto — to 90 per cent — could result in over 10,000 infections within 20 years and 100,000 infections in 30 years.
- Pertussis is an ongoing cause of illness in Toronto — even though 80 per cent of children are immunized. The ongoing spread may be because many teens and adults are not immunized and that protection from the vaccine decreases over time. However, lower vaccination rates would make the problem much worse: declines in pertussis vaccination coverage maintained over five years in Toronto could result in as much as a 600 per cent increase in severe disease in children under two years of age.

To maintain our hard-won health gains, we must be vigilant and continue to invest in and promote Ontario's immunization programs.


"High vaccination rates are vital to keep a city healthy, and must not be taken for granted. Our data shows that if vaccine coverage falls, we will once again be vulnerable to outbreaks of preventable disease."
Dr. David McKeown,
Medical Officer of Health, City of Toronto

ONTARIO'S IMMUNIZATION PROGRAMS TODAY



ONTARIO'S IMMUNIZATION PROGRAMS TODAY

Vaccines are one of the best medicines we have, and one of the most important tools in our prevention toolbox.

Over the past almost one-and-a-half centuries, Ontario has built a strong immunization system that focuses on ensuring vaccines are safe, making immunization as accessible as possible and being responsive to changing needs.

Safety First

To ensure the vaccines distributed in Ontario are as safe as possible, the public health system takes a number of steps — in addition to the very strict federal requirements for vaccine production and monitoring — including:

- **Seeking expert advice.** Ontario has established expert advisory groups including an expert committee that recommends which new immunization programs Ontario should adopt and how best to deliver them.
- **Conducting program evaluation and research.** In 2007, Ontario established Public Health Ontario (PHO) to provide scientific and technical advice to the public health system on a range of issues including immunization. PHO carries out program evaluation and research evaluating vaccine coverage, safety and vaccine program impact in Ontario.
- **Contributing to national and international efforts to control infectious diseases.** PHO and other Ontario experts participate on various immunization committees led by the World Health Organization, the Pan American Health Organization and the Public Health Agency of Canada.
- **Monitoring vaccine safety.** Ontario participates in an extensive vaccine safety surveillance system. Physicians and other health care providers are required to report any adverse reactions to a vaccine, and that information is reviewed at the local and provincial levels. The findings are included in public vaccine safety reports. Data are also fed into the Canadian Adverse Events Following Immunization Surveillance System, which monitors vaccine safety at the national level. The data are carefully assessed to identify any potential vaccine safety issues.

Convenient and Accessible Programs

Ontario's immunization programs are delivered by skilled health care providers, including physicians, nurse practitioners, nurses and pharmacists, who all also play a key role in educating people about the importance of vaccines. Depending on the type of vaccine and where they live, Ontarians may get their immunizations at a doctor's office, a school or community-based clinic run by local public health units, a pharmacy or through a travel clinic.

- In most parts of **Ontario, infant and early childhood vaccines** are given by primary care providers (family physicians, nurse

practitioners or pediatricians) — and they are timed to coincide with regular well-baby and well-child visits.

- Ontario is a leader in **school-based immunizations**. By going into the schools, public health can reach the largest number of adolescents at the right age for a vaccine. Currently, three vaccines are given at school: hepatitis B, meningococcal and human papillomavirus (HPV) vaccines.
- In 2012, to make it easier to get care closer to home or during extended hours, Ontario began offering flu shots through **pharmacies**. Specially trained pharmacists are able to give the flu shot to anyone who is five years of age or older. The government is now considering having pharmacists administer some travel vaccines.
- Some public health units run community-based clinics to give the flu shot each year. Ontarians can also go to immunization clinics held by any of the province's 36 public health units for some other vaccines.
- For adults and seniors there are a variety of settings to receive vaccines including, family physicians or nurse practitioners — and all community health centres and most public health unit clinics — can provide all of the province's publicly-funded vaccines. Community health centres and some public

ONTARIO PIONEERS THE WAY[24]

Ontario introduced its first publicly-funded immunization program in 1882 — against smallpox. Over the years, the province has also made major contributions to global vaccine efforts.

At the beginning of the 20th century, diphtheria was the number one killer of children under the age of 14. In 1913, J. G. Fitzgerald, an Ontario physician and public health specialist, used his wife's inheritance to buy horses — required to produce diphtheria antitoxin — and build a backyard laboratory and stable. Fitzgerald's goal was to mass produce public health products and make them available at affordable prices. His enterprise became the publicly-funded Connaught Antitoxin Laboratories and University Farm, which:

- produced tetanus vaccine during World War I
- developed a new diphtheria vaccine
- discovered Medium 199 — a base to develop a safe polio vaccine
- developed a one-shot combination vaccine for diphtheria, pertussis and tetanus

In the 1930s, Toronto and Hamilton were among the first cities in the world to be declared diphtheria-free — thanks to the early introduction of diphtheria immunization programs when the vaccine first became available.

If Ontarians had to pay for all the vaccines that are recommended from infancy to old age, it would cost about $2,500 a person.

health units will immunize people who do not have an OHIP card to make sure they too are protected.

- Some workplaces offer immunization clinics – particularly for flu shots.

Timely, Responsive Immunization Programs

Today, the province with strong government leadership and support provides 22 vaccines that protect Ontarians of all ages against 16 diseases (see ontario.ca/vaccines).

Over time the number of vaccines has increased as Ontario responds to disease threats. There are three ways the province takes action to meet changing needs:

1. To protect Ontarians against more diseases the province **adds new vaccines to the routine immunization schedule** such as the rotavirus vaccine in 2011 to help protect infants from severe diarrhea, vomiting and dehydration. Ontario was the first jurisdiction in Canada to publicly fund the rotavirus vaccine after the National Advisory Committee on Immunization recommended its use for infants in July 2010.

When it comes to the flu shot, Ontarians appreciate convenience. In 2014–2015, 900,000 people got their flu shot from a pharmacist — up from 250,000 in the first year of the pharmacy-based program in 2012–2013.

2. To protect Ontarians against more strains of certain diseases the province **updates existing vaccines with ones that offer more protection**. For example, in 2009, the existing grade seven meningococcal conjugate C immunization program was updated with a vaccine that protected against three additional types (serogroups A, Y and W) of meningococci.

3. To protect adults and those at high risk, Ontario **enhances the existing immunization schedule to include more Ontarians**. For example, as of December 2014, the province now offers all adults routine whooping cough immunization instead of limiting it to those under 65, and has expanded the criteria for the high-risk meningococcal conjugate ACYW vaccine.

(See Appendix 1 for a timeline history of Ontario's Publicly-Funded Immunization Schedule.)

Effective Use of Public Education and Legislation

Given the recent increase in vaccine hesitancy, it is now more important than ever to reach people through multiple channels and through the networks they are already using. That is why the Ministry of Health and Long-Term Care has been building on its social media outreach, which has included Twitter Town Halls, blogs such as the Yummy Mummy Club and Facebook posts. The ministry's immunization campaigns have used online advertising that directs parents back to rich content on the ministry website — as well as more traditional methods of reaching the public, through stories for local newspapers and news releases to the media.

One of the most effective tools to encourage people to be fully immunized is legislation.

Ontario is one of only three provinces in Canada with a law — *Immunization of School Pupils Act*, enacted in 1982 and modified since — requiring documentation on the immunization status of all school-age children in order for them to attend school. Under this legislation, public health units are required to collect and maintain the immunization records of all students attending schools. Children who are not up-to-date with their immunizations and don't have a valid exemption can be suspended from school.

If an outbreak of one of the diseases covered under the *Immunization of School Pupils Act* were to occur, the unvaccinated children would be excluded from school to protect them and other students until the medical officer of health was satisfied that the outbreak was over.

ONTARIO FIRST TO INTRODUCE UNIVERSAL FLU SHOTS

In the fall of 2000, Ontario was the first jurisdiction in the world to introduce a universal influenza immunization program (UIIP), which offered free flu shots to anyone age six months or older who lives, works or attends school in Ontario. Similar programs are now offered in eight other Canadian jurisdictions and other countries, including regions in the United States.

Early evaluations of the program found a positive impact on reducing flu-related hospital, emergency room and health care visits. A full review of the program is currently underway.

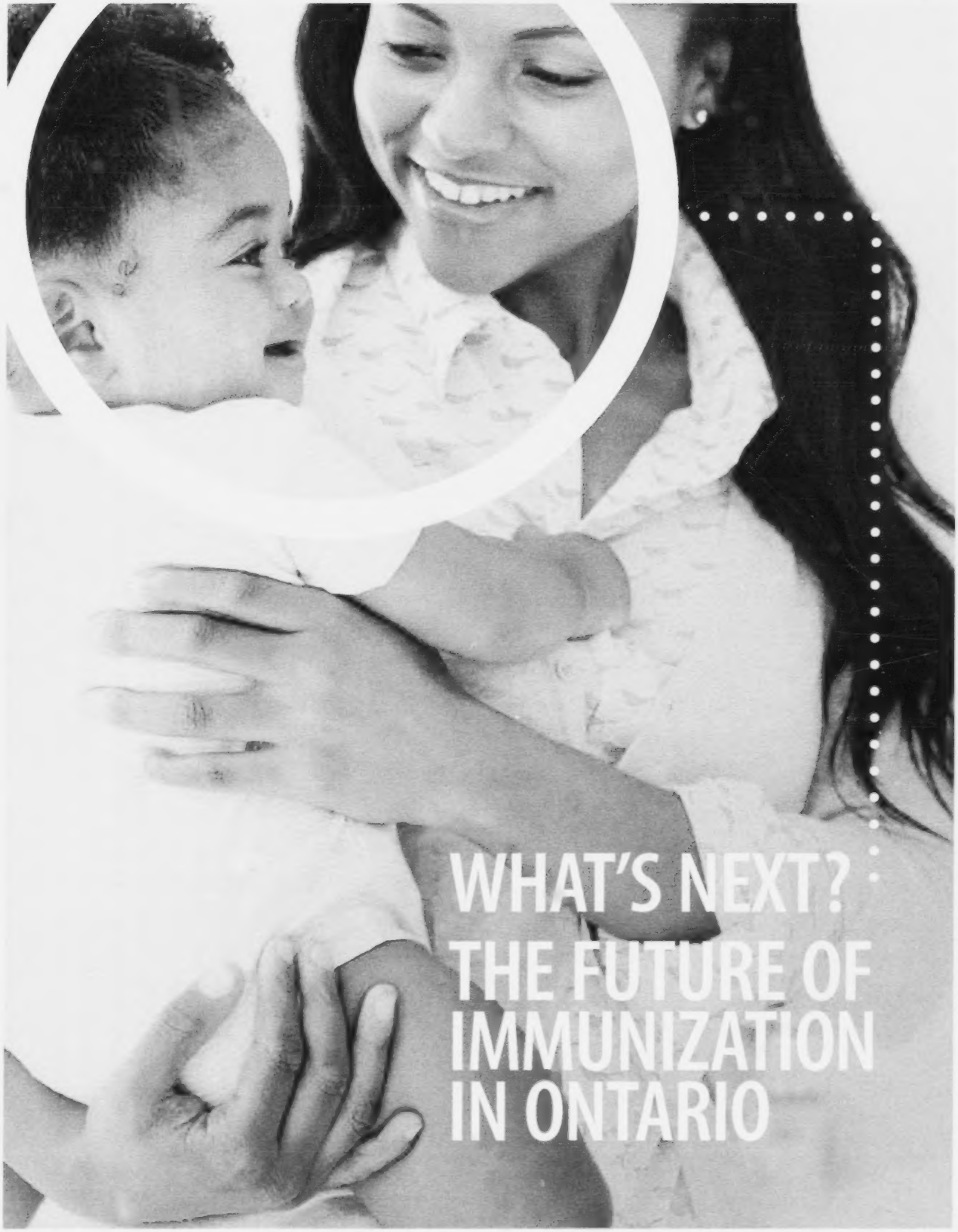
Because the schedule of immunizations has changed over the years, the legislation was most recently updated in 2014 to reflect new immunization schedules and vaccines.

Keeping a Strong System Strong

As strong and successful as Ontario's immunization system has been, there's still room for improvement. In 2012, the Ministry of Health and Long-Term Care asked a group of experts to review the immunization system and recommend ways to improve it. As well, in December 2014, the Annual Report from the Office of Auditor General of Ontario included the results of an audit of Ontario's immunization programs. Both the Expert Group and the Auditor General's Office made recommendations that will help the system stay strong, be more effective and efficient, keep better track of immunizations, make immunizations more convenient and build public confidence. As a result of these efforts, *Immunization 2020: Modernizing Ontario's Publicly Funded Immunization Program* has recently been released. *Immunization 2020* is a first-of-its-kind roadmap for Ontario that will help the government and its partners achieve a high-performing, integrated immunization system.

Children and adolescents attending primary or secondary school in Ontario must have proof of immunization (or valid exemption) against:

- Diphtheria • Tetanus • Polio • Measles
- Mumps • Rubella • Meningococcal Disease
- Pertussis (whooping cough)
- Varicella (chickenpox) — for children born in 2010 or later



WHAT'S NEXT? THE FUTURE OF IMMUNIZATION IN ONTARIO

WHAT'S NEXT?
THE FUTURE OF IMMUNIZATION IN ONTARIO

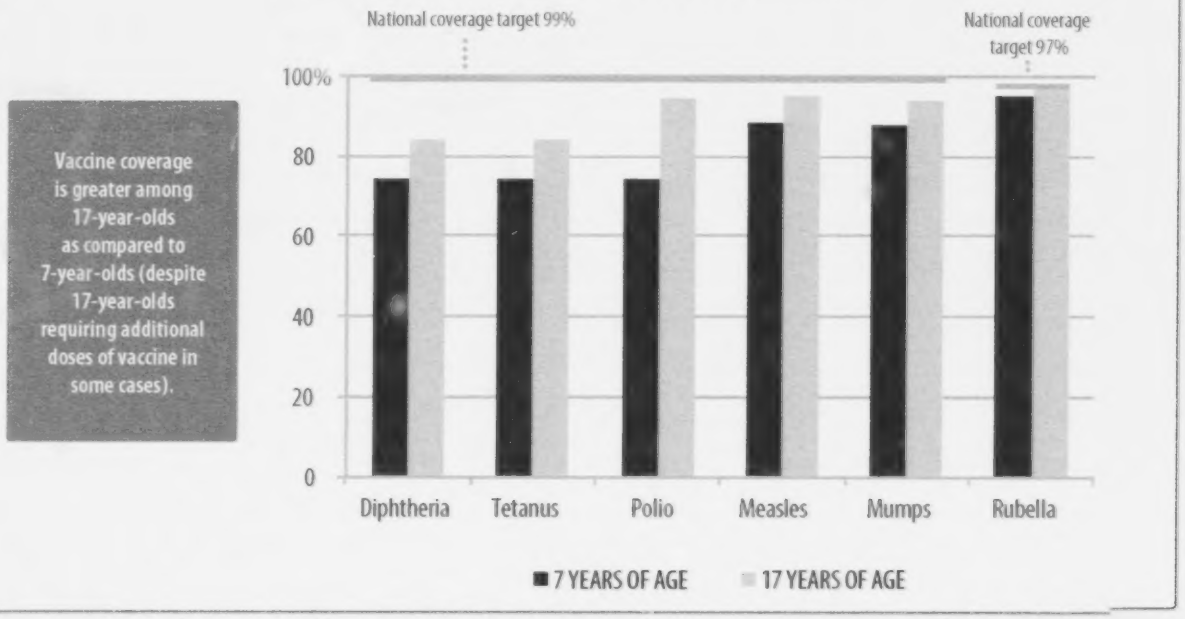
Immunization is and will continue to be a priority in Ontario. In his 2015 *Patients First: Action Plan for Health Care*, the Minister of Health and Long-Term Care reaffirmed the government's commitment to a strong, effective immunization system. In addition, the ministry has developed *Immunization 2020: Modernizing Ontario's Publicly Funded Immunization Program*. This strategy will put into action many of the recommendations from the Immunization System Review and the Auditor's Report.

As Chief Medical Officer of Health for Ontario, I believe the following five key steps will help create a modern, safe and effective immunization program that will protect all Ontarians against vaccine-preventable disease. They will also make immunization more convenient, reduce complacency and build public confidence.

01 Join the Conversation – It Takes All of Us!

To achieve the high coverage rates we need to protect everyone's health, we must maintain and build public confidence in immunization programs. Most Ontarians choose to have themselves and their children vaccinated. We enjoy high vaccination rates — particularly for childhood immunizations — for most diseases.

FIGURE 4: 2012–13 ONTARIO SCHOOL PUPILS' IMMUNIZATION COVERAGE (%) FOR SELECT VACCINE PROGRAMS STARTING IN INFANCY AND EARLY CHILDHOOD[25]



However, to keep and build public confidence and increase vaccination rates, we have to "join the conversation" where they are at. We must listen to people's concerns and respond. It's our job to provide information, "meeting people where they are" (see previous section on public education). By being part of the conversation, we will help informed Ontarians make informed decisions.

While the system is unlikely to change the minds of the very small number of people who are truly opposed to vaccination, we know that — based on lessons learned from the recent measles outbreak — we can reach people who are hesitant about vaccines. Look at the impact of Jennifer Hibben-White's blog: hundreds of people sent her messages saying that she had changed their minds about vaccines. Based on her experience, Jennifer said, "The pro-health movement really needs strong trusted advocates who can address and dismiss the anti-vaccine claims. We have to be better at knocking down their arguments, in strength and in numbers."[26]

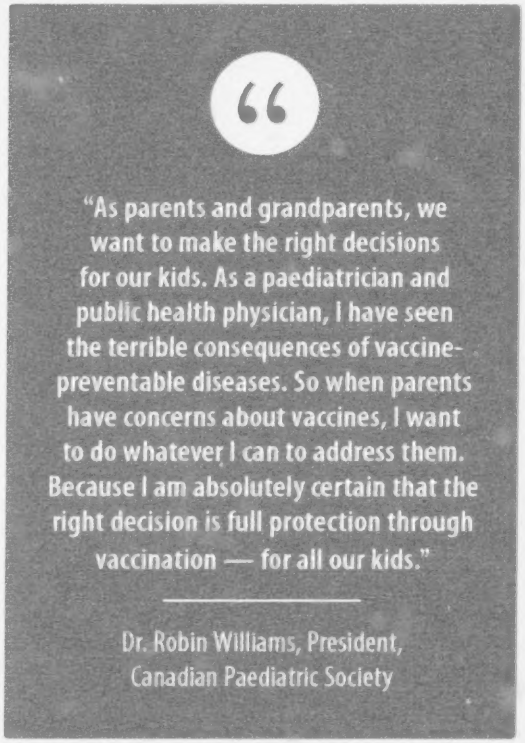
Parents want to do what's best for their children. They are constantly weighing the risks and benefits of everything that affects them. With diseases like measles that have become less common, it may be harder for parents to see that the risk actually exists — until they are faced with the sudden reality of a child with or exposed to measles.

During the recent measles outbreak in the Niagara Region, the public health nurses responded to 12,000 phone calls. They took the time to "join the conversation" and answer parents' questions.

The public health system must be an active part of the conversations that are taking place — in person and on social media — that inform people's decisions.

Health care providers are one of the most trusted sources of health advice for Ontarians. The media also plays an important role in informing the public and building confidence in immunization. During the recent measles outbreak, newspapers ran editorials in support of vaccination. They also covered the story of an Ontario family whose unvaccinated children contracted pertussis. The family, which had been vaccine hesitant, chose to go public in the hope of preventing others from experiencing the fear and sickness a vaccine-preventable disease can cause.[27]

The public health system needs to work closely with health care workers and the media to ensure they have accurate up-to-date scientific information on vaccines, vaccine safety and best practices. This information will help them be strong voices


"As parents and grandparents, we want to make the right decisions for our kids. As a paediatrician and public health physician, I have seen the terrible consequences of vaccine-preventable diseases. So when parents have concerns about vaccines, I want to do whatever I can to address them. Because I am absolutely certain that the right decision is full protection through vaccination — for all our kids."
Dr. Robin Williams, President, Canadian Paediatric Society

in the conversation, actively encouraging the public to be fully immunized here at home and when they travel.

02 Virtually Replace the "Yellow Card"

It's time to move Ontario's systems for keeping track of immunizations into the 21st century. One of the best ways to strengthen Ontario's immunization programs is to expand the information systems to track all immunizations for all Ontarians in real time.

Panorama, a public health immunization information system, is broadly used for school-aged children, across Ontario (and in five other Canadian jurisdictions). With the initial intense focus on Ontario's schoolchildren, the foundation for a full provincial immunization registry has been established. To date, more than 83 million Ontario immunization records are stored in Panorama.

Because of the complete and accurate information in Panorama:

- Public health nurses know which child requires which vaccine at which time.
- They can talk to parents about all their child's vaccine needs in one visit.
- With the complete and accurate information, children who are up-to-date with their immunizations won't be unnecessarily suspended from school.
- When an outbreak occurs, the public health system can quickly identify children who are unimmunized or partially immunized who should stay

HEALTH PROVIDERS' ROLE: BUILDING CONFIDENCE AND CORRECTING MISINFORMATION

Dr. Upton Allen, Chief of Infectious Diseases at The Hospital for Sick Children (SickKids), has spent many hours talking to parents about vaccines. "I find that the before-and-after stories help explain how important vaccines are. For example, I tell them how in the 1980s, I was taking care of many children on the wards with meningitis from *Haemophilus influenzae* type b (Hib), some of whom died or were left with motor, learning and hearing problems. Then I ask them how many cases we see now. When I say 'zero to one every few years,' they are shocked.

"We have to reinforce the fact that the risk of getting seriously ill from vaccine-preventable diseases is still present. One of the most compelling examples of the impact of not having children vaccinated occurred last year, when we experienced a case of tetanus at our hospital. The idea that, in 2015, we would see a child with tetanus in Toronto is unbelievable to most people.

"We also need to get the message out that vaccines are safe. We have to take the time to answer parents' questions and to make sure they have the right information. Many people with whom I have spoken are just misinformed. For example, a family whose child was being prepared for a transplant once wondered about the challenge that vaccines would pose to the child's immune system. A much more profound challenge would come from receiving the life-saving donor organ. In these situations, we are often able to talk it through so parents can understand the actual risks and benefits of the vaccines."

home to avoid being exposed. The system can also reallocate vaccine supplies and respond quickly to any vaccine issues or shortages.

- The public health system can assess the uptake and effectiveness of different immunization programs for school children.

Ontario should continue to invest in this provincial immunization information system so that all immunizations can be tracked in real time for all Ontarians. The system must be extended to incorporate standardized immunization data from all health care providers, not just public health. In doing so:

- Through their health care providers, all individuals will be able to know which immunizations they have had and which ones they need and when.
- All health care providers will have easy access to consolidated and up-to-date information on their patients' immunizations and will be able to encourage people to receive the right immunizations at the right stage of life.

By continuing to improve information systems, Ontarians will be better protected against vaccine-preventable diseases and immunization programs will be more efficient and convenient for Ontarians and more cost-effective for the health system.

03 Make It Easier for Everyone to be Immunized

One of the biggest barriers to immunization is the complex schedule of immunization.

More combination vaccines and a simpler immunization schedule would make immunization more convenient, but that change is not likely to happen for a while. In fact, the immunization schedule is likely to get more complicated as the system continues to add new vaccines. With the ability of the Panorama system to now forecast which vaccines are required for each client, the understanding and interpretation of the schedule will improve.

As part of the immunization registry, the system should create portals where Ontarians can easily and securely obtain their immunization information as well as mobile apps and reminders to help busy parents and families keep their immunizations up-to-date.

In addition to making it easier for people to know which vaccines they need and when, the system can help by providing vaccines in locations where people already are every day — like workplaces, pharmacies and schools. Making immunizations more accessible will make it easier for adults and children to stay on top of their vaccinations.

MORE THAN 83,000,000

The number of immunization records stored in Panorama as of July 2015.

THE IMPACT OF EFFECTIVE INFORMATION SYSTEMS

Panorama has already proved its value. During a recent measles outbreak, one of the public health units used the system to quickly identify children who had not been vaccinated and could have been exposed to measles at school. Their parents were directly contacted to ensure the child was removed from the school environment where they could be at risk, and to support most of them to be vaccinated. Out of the 950 students who attended the school, the Niagara Region public health unit personally contacted all parents of the 36 school-age children who were not completely vaccinated. Staff at the health unit had individual conversations with each family and built trust with them. At the end of the day, only nine children remained unvaccinated against measles.

Their experience reinforces that those who are truly vaccine hesitant need more personal communication: they need a one-to-one conversation with someone they trust.

04 Pain-Free Immunizations

Another barrier to people being fully immunized is the fact that needles hurt a little, and no parent likes to see their child in pain. Providers use a range of strategies to make needles less painful, such as having mothers breastfeed babies, distracting children or numbing the injection site.[28] These techniques work and should be used more widely.

In addition, new technologies, such as needle-free immunization, hold great promise. There are already some vaccines that can be taken orally (e.g., rotavirus, some travel vaccines) or through a nasal spray (flu). Work is underway on a measles vaccine that can be delivered through a patch on the skin.

In the future, Ontario should put more focus on encouraging the development of pain-free ways to deliver vaccines as well as more effective ways to make vaccinations less painful.

05 Stay Alert to Current and Emerging Threats

The main focus of this report has been on improving immunization rates for diseases for which we already have vaccines. But we must not lose sight of the work that still needs to be done to prevent other illnesses.

Ontario must be ready to adopt and provide new vaccines that can benefit Ontarians as they become available.

Immunization 2020 provides a roadmap for improving the effectiveness, efficiency and sustainability of all aspects of Ontario's publicly-funded immunization program.

Allison McGeer, Infectious Disease Consultant at Mount Sinai Hospital, has been on the front lines in four recent disease outbreaks (SARS 2003, H1N1 pandemic 2009, MERS 2013 and Ebola 2014):

"Vaccines are the first line of protection against infectious diseases. When the media call me to talk about MERS, SARS and Ebola, one of the first things they ask is: 'when will we have a vaccine?' As a society we expect that, when a disease emerges that we're worried about, there will be a vaccine.

"The questions about vaccines for new diseases always remind me that we still have work to do to develop vaccines for infectious diseases that — unlike SARS, MERS and Ebola — are circulating in Ontario right now and causing an enormous burden of disease, such as hepatitis C, Clostridium difficile associated disease and invasive streptococcal disease.

"We don't want to get caught where we've been caught so often, where we have a group of vaccines, things get better so we can take a break. We don't want to make that mistake again. We need to look ahead so new and changing pathogens, like Ebola, don't catch us off guard. We need to be working on those vaccines now so we're ready before those diseases threaten more people."

FINAL THOUGHTS

"After the provision of safe water, immunization has prevented more illness and disability, and has saved more lives than any other intervention in the history of medicine. Millions of people in Canada and around the world have been spared the ravages of many infectious diseases, and parents the heartache of the death or disability of a child. We must never forget how immunization protects us and our children, and that these infections will return if we become complacent. Immunization must continue to be a priority for Ontarians to sustain the high level of protection that we have worked so hard to achieve."

Dr. Ian Gemmill, Chair, National Advisory Committee on Immunization

Vaccines are one of the best medicines. Over the past 100 years, vaccines have radically changed our lives. They have improved health, kept us from experiencing many life-and-limb threatening illnesses and allowed us to live longer.

Ontario aspires to a province — and a world — where no more children die from vaccine-preventable illness and where we have actually eradicated many more infectious diseases than just smallpox.

This goal is possible. It starts here at home — with strong, safe immunization programs. It starts with all Ontarians understanding the value of vaccines, and the importance of both individual immunity to protect their own health and community immunity to protect everyone. It starts with all of us choosing to be fully immunized at the right time with all the vaccines recommended to help keep us well.

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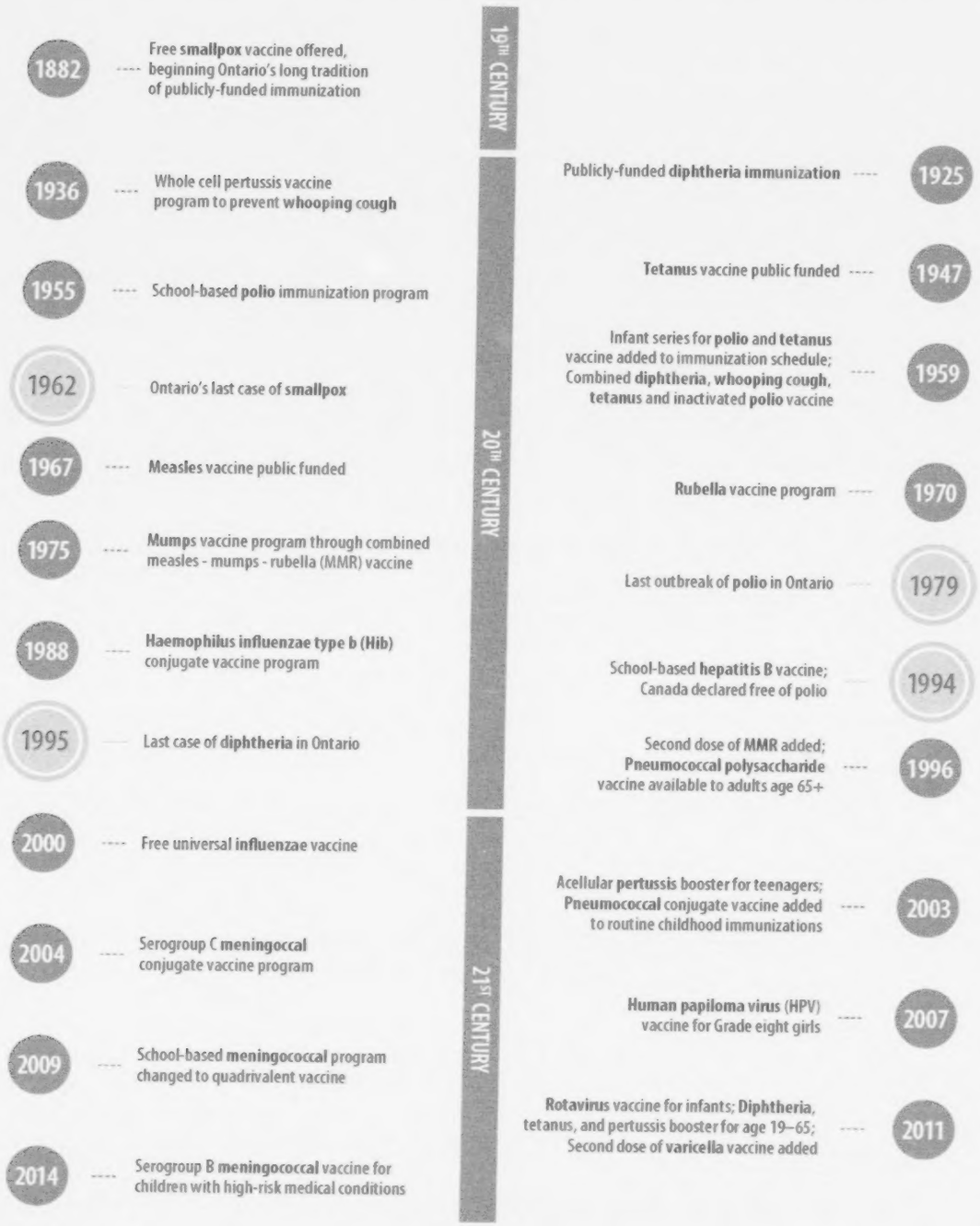
APPENDIX 1

HISTORY OF ONTARIO'S PUBLICLY-FUNDED IMMUNIZATION PROGRAM


19TH CENTURY
20TH CENTURY
21ST CENTURY
1882
Free smallpox vaccine offered, beginning Ontario's long tradition of publicly-funded immunization
1925
Publicly-funded diphtheria immunization
1936
Whole cell pertussis vaccine program to prevent whooping cough
1947
Tetanus vaccine public funded
1955
School-based polio immunization program
1959
Infant series for polio and tetanus vaccine added to immunization schedule; Combined diphtheria, whooping cough, tetanus and inactivated polio vaccine
1962
Ontario's last case of smallpox
1967
Measles vaccine public funded
1970
Rubella vaccine program
1975
Mumps vaccine program through combined measles - mumps - rubella (MMR) vaccine
1979
Last outbreak of polio in Ontario
1988
Haemophilus influenzae type b (Hib) conjugate vaccine program
1994
School-based hepatitis B vaccine; Canada declared free of polio
1995
Last case of diphtheria in Ontario
1996
Second dose of MMR added; Pneumococcal polysaccharide vaccine available to adults age 65+
2000
Free universal influenzae vaccine
2003
Acellular pertussis booster for teenagers; Pneumococcal conjugate vaccine added to routine childhood immunizations
2004
Serogroup C meningoccal conjugate vaccine program
2007
Human papiloma virus (HPV) vaccine for Grade eight girls
2009
School-based meningococcal program changed to quadrivalent vaccine
2011
Rotavirus vaccine for infants; Diphtheria, tetanus, and pertussis booster for age 19–65; Second dose of varicella vaccine added
2014
Serogroup B meningococcal vaccine for children with high-risk medical conditions

APPENDIX 2

Ontario Public Health Units with Vacant Medical Officer of Health (MOH) Positions Filled By Acting MOHs as of December 31, 2014

Elgin-St. Thomas Health Unit
Haldimand-Norfolk Health Unit
Huron County Health Unit
County of Oxford Department of Public Health and Emergency Services
Porcupine Health Unit
Total = 5 Health Units with MOH Vacancies

**Under 62. (1)(a) of the Health Protection and Promotion Act, every board of health shall appoint a full-time Medical Officer of Health.*
***Vacancies may include positions filled by qualified physicians awaiting appointment by boards of health and ministerial approval.*

Ontario Public Health Units with Vacant Associate Medical Officer of Health (AMOH) Positions as of December 31, 2014

City of Hamilton Public Health
Durham Regional Health Unit
Niagara Regional Health Unit
Sudbury and District Health Unit
Toronto Public Health
Total = 5 Health Units with AMOH Vacancies

**Under 62. (1)(b) of the Health Protection and Promotion Act, every board of health may appoint one or more Associate Medical Officers of Health.*
***Vacancies may include less than or more than one FTE position per health unit and include positions filled by qualified physicians awaiting appointment by boards of health and ministerial approval.*

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